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The Development of Early Attachment Behaviours

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The normative development of attachment behaviours and the changing relationship between the level of activation of the attachment system and the intensity of subsequent attachment behaviours were studied longitudinally from 3 to 12 months of age. The study was based on Bowlby's notion about increasing goal directedness of the attachment system. The sample consisted of two groups of children, 33 children born with cleft lip and palate and 34 children without this congenital anomaly. To circumvent the age-limited applicability of the Strange Situation procedure, a new observational instrument was developed, the so-called Induced Stress at Home procedure. It appeared that the ISH procedure is a valid alternative to induce and measure the attachment behaviours proximity seeking, contact maintenance and avoidance. Using the multilevel model for longitudinal data, it was shown that attachment behaviours are not very stable across age. An elaborated model revealed that the relationship between activation of the attachment system and subsequent contact maintenance and resistant behaviour become less strong with age. No differences between children with and without cleft lip and palate were found.

Keywords: attachment; development; longitudinal; multi-level; hierarchical linear model; validity

Since 1969, the year in which Ainsworth and Wittig published on the Strange Situation procedure, an immense amount of research has been devoted to the antecedents of secure versus insecure attachments. This research has revealed a number of important determinants of the quality of attachment (see for a review Lamb *et al.*, 1985; see also Van den Boom, 1988). However, insight into the determinants of Strange Situation behaviour does not reveal the developmental course of attachment, just as causes of physical growth do not give insight into the course of physical growth.

In attachment research little attention has been devoted to the developmental course of attachment. This is remarkable because Bowlby, the originator of attachment research, took great pains to describe the ontogeny of attachment (see Bowlby, 1969). The scant attention given to the development of attachment may probably be attributed to the stimulating effect of the studies of Ainsworth, which were mainly concerned with individual differences (Lamb *et al.*, 1985).

Given the development of attachment, two questions may be proposed. The first question concerns the normative development of observable attachment behaviours: how do they develop with age? More specifically: how does the intensity of observable attachment behaviours change when a

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child grows older? Attachment behaviours are thought to function within a hypothetical attachment system (Bowlby, 1969). It is generally assumed that stress or fear functions to activate the attachment system and that once the system is activated the child will try to reduce or terminate its activation by directing attachment behaviours towards specific persons (Ainsworth *et al.*, 1978; Bischof, 1975; Lamb *et al.*, 1985). Given this general assumption, a second question is: how does the relationship between activation of the system and the level or intensity of subsequent behaviours change with age?

In the present study, the development of attachment behaviours and of the functioning of the attachment system were studied longitudinally during the first year of life. A third question was added to the questions mentioned, based on a review article by Koomen and Hoeksma (1990), who argued that the development of attachment of children born with cleft lip and palate may be at risk. Therefore, the third question addressed is: how does the development of attachment behaviours and the functioning of the attachment system differ between children with cleft lip and palate and children without such an anomaly?

The almost universally used instrument in attachment research, the Strange Situation, is not thought to be applicable before the end of the first year of life. To tackle this problem of limited applicability, we developed a procedure labelled the 'Induced Stress at Home procedure', by means of which attachment behaviours can be induced at earlier ages. The ISH procedure is a new instrument, for which reason we first investigated the preliminary question: is the ISH procedure a valid alternative to the Strange Situation to measure attachment behaviours?

THE ATTACHMENT SYSTEM

The term 'attachment system' refers to an intrapsychological regulatory system (Bretherton, 1985). Viewed from an outside observer's perspective, the system's set goal is to regulate behaviours that maintain proximity to and contact with a discriminated protective person. From the psychological vantage point of the child, the system's set goal is to achieve felt security (Bischof, 1975; Bretherton, 1985; Sroufe and Waters, 1977a). The attachment system can be activated by stress or fear. In the Strange Situation procedure, the road par excellence to study the attachment system, stress and

fear are induced by introducing a stranger and by separation of the child from the mother in a strange environment. Stranger anxiety (Bowlby, 1969) and separation distress (Schaffer and Emerson, 1964; Stayton *et al.*, 1973) only comes into existence somewhere in the second half of the first year of life, which accounts for the already mentioned restricted applicability of the Strange Situation. The attachment system can, however, also be activated by other conditions, like hunger or pain, or the occurrence of alarming events in the environment (Bowlby, 1969). In the present study, the latter condition was used to activate the attachment system at earlier ages. As will be more fully explained in the Methods section, we devised a procedure involving a short separation during which an alarming event occurred, followed by reunion of mother and child. The short separation can be used to infer the level of activation of the child's attachment system by assuming that the level of activation is reflected by the child's level of distress. In addition, the subsequent reunion episode can be used to observe the child's attachment behaviours in the same way as is done in the Strange Situation.

Two active behaviours generally observed during reunion in the Strange Situation are proximity seeking and contact maintenance. Proximity seeking refers to active initiative in seeking physical contact with or proximity to another person (Ainsworth *et al.*, 1978). Contact maintenance refers to the degree of active and persistent initiative which a child exerts to preserve physical contact with a person, once such contact is achieved (Ainsworth *et al.*, 1978). Both behaviours are considered to belong to the class of attachment behaviours (Sroufe and Waters, 1977a), because they result in increased proximity or contact with the mother and at a psychological level in an increase of felt security.

Besides proximity seeking and contact maintenance, observations in the Strange Situation include two other kinds of behaviours, i.e. resistance and avoidance. Resistance pertains to 'pushing away from, striking out at, or squirming to get down from an adult who has offered contact' (Ainsworth *et al.*, 1978, p. 53). Behaviour is labelled avoidant when a child actively evades proximity and interaction in a situation in which the common response is to seek proximity and contact. In a strict sense, resistance and avoidance do not belong to the class of attachment behaviours. As such, they are sometimes referred to as 'non-attachment behaviours' (Sroufe and Waters, 1977a). Nevertheless,

both resistance and avoidance are considered to be affected by the attachment system (Ainsworth *et al.*, 1978). For this reason we will use the label 'attachment behaviours' for all four behaviours: proximity seeking, contact maintenance, resistance and avoidance.

In the Strange Situation procedure, ratings of the above-mentioned four behaviours in the two reunion episodes are used to assess the quality of attachment of an individual child: i.e. secure versus resistant and avoidant attachments (Ainsworth *et al.*, 1978). These classifications, which refer to the functioning of the individual attachment system, point to an important aspect of the attachment construct. Since the seventies, attachment has been considered an organizational construct (Sroufe, 1985; Sroufe and Waters, 1977a), indicating that it does not refer to separate behaviours but to the way behaviours are organized.

We consider that research into the development of attachment should ultimately result in a normative description of how the organization of behaviours changes with age. In the absence of empirical data concerning attachment behaviours at early ages, such a goal is not (yet) feasible, however. A first step to achieve this goal is to chart the developmental course of the separate behaviours proximity seeking, contact maintaining, resistance and avoidance and to describe how the assumed relationship between activation of the attachment system and subsequent behaviours changes during the child's first year of life.

DEVELOPMENT

According to Bowlby (1969), the child's attachment evolves along four phases (see also Ainsworth, 1972), of which the second and third phases, called 'Orientation and signals directed towards one (or more) discriminated figure(s)' and 'Maintenance of proximity to a discriminated figure by means of locomotion as well as signals', span the age range of the present study. Van IJzendoorn (1988) notes, however, that this phase description does not contain well-defined sharp boundaries and that the development of attachment can best be conceived as a *fluent developmental line*.

Particularly relevant to a conception of the development of attachment as being continuous is Bowlby's notion that the attachment system becomes increasingly goal corrected (or goal directed) and increasingly organized around the primary caregiver when the child grows older.

Increasing goal correctedness refers to the phenomenon that the child becomes more and more able to take environmental feedback into account and to choose and adjust its actions accordingly. Increasing organization around the primary caregiver points to the phenomenon that the child will increasingly direct its attachment behaviour to its primary caregiver. To give an example: a 10-week-old baby can react to a frightening situation only by crying, i.e. signalling to someone to come closer, and can be soothed by whatever person is there. In contrast, a 1-year-old child may react to the same situation by selecting behaviour according to the circumstances and is less likely to be fully reassured by another person than its mother.

The development of the attachment system is part of the child's general development. Most salient during the first year of life is the child's strongly increasing motor competence, which directly affects its attachment behaviour (Ainsworth *et al.*, 1978; Bowlby, 1969). To give another example: a 10-week-old child can only avoid the mother during a stressful experience by averting its gaze, whereas a 1-year-old child may actively crawl away from its mother to avoid her.

What may be expected concerning the development of attachment behaviours and the functioning of the attachment system with the notion of increasing goal correctedness, preferential organization around the primary caregiver and increasing motor competence in mind? In tentatively answering this question, we limit ourselves to a situation resembling the Strange Situation, that is, a brief separation from the mother under stressful conditions followed by reunion with the mother.

First, we will consider the normative development of attachment behaviours, by offering some expectations about how the level or intensity of attachment behaviours changes when a child grows older. Secondly, we offer some expectations about the changing relation between activation of the attachment system and subsequent attachment behaviours.

Attachment Behaviours

The degree or intensity of active proximity seeking and contact maintenance is to a large extent dependent on the child's motor competence, for which reason it is expected that both behaviours will increase when the child grows older. In addition, following Bowlby, it is assumed that the

child's proximity seeking and contact maintenance will become increasingly directed to the mother. It is therefore hypothesized that in situations where the mother is present, higher levels of proximity seeking and contact maintenance will become more likely as the child grows older.

Resistance and avoidance are also active behaviours of which the intensity is likely to increase with the child's increasing motor competence. Resistance is not goal directed, however, in the sense that it does not further the presumed goal of the attachment system: proximity to the mother, or felt security. As such, resistant behaviours should become less likely when the goal correctedness of the attachment system increases, which is assumed to happen when the child grows older. This expected negative trend for resistance, based on the increasing goal correctedness of the attachment system, is opposite to the expected positive trend, due to increasing motor competence. Which of these two expected trends prevails, only the data can show.

The developmental course of avoidance is also hard to capture in a specific developmental hypothesis. In a literal sense, avoidance does not promote proximity. In addition, Sroufe and Waters (1977a) consider avoidant behaviour to be maladaptive, in the sense that it does not increase the child's degree of felt security. Main (1981) argues, however, that avoidant behaviour prevents the child from behavioural disorganization, thereby serving the attachment system. So, a specific hypothesis about the developmental course of avoidance is dependent on the function one wants to ascribe to avoidance. Maybe the observed data may shed some light on this issue.

Activation of the System and Subsequent Behaviours

A principal feature of the goal-corrected attachment system is that the conditions which terminate its activation vary according to the intensity of its activation (Bowlby, 1969). This feature leads to the supposition that there is a monotonically increasing relation between the intensity of activation on the one hand and the intensity of subsequent attachment behaviours, which eventually lead to termination of its activation, on the other. In the situation at hand, a brief separation under stressful conditions, the intensity of activation can be inferred from the distress (i.e. signalling behaviour) shown by the child during separation, whereas the behaviours

which terminate its activation can be observed during reunion with the mother. It can be hypothesized that the strength of the relation between the intensity of activation and subsequent behaviours differs from one behaviour to another (i.e. between proximity seeking, contact maintenance, resistance and avoidance) and from age to age. This expectation is based on differences in goal directedness of the different behaviours and presumed increasing goal directedness of the attachment system with age. More specifically, we hypothesize that the attachment behaviours proximity seeking and contact maintenance will be more strongly related to the intensity of activation than the 'non-attachment' behaviours resistance and avoidance. In addition, we hypothesize that the relationship between activation of the system and subsequent proximity seeking and contact maintenance will become stronger with age, reflecting increasing goal directedness of the system. Along the opposite line of reasoning, it is expected that the relation between activation and subsequent resistant behaviour will attenuate with age. A specific hypothesis about the changing relation between activation of the system and avoidance is again dependent on the function one wishes to ascribe to avoidance.

GROUP DIFFERENCES

So far we have considered the normative development of attachment behaviours and the relationship between activation of the system and subsequent behaviours without paying attention to characteristics of mothers and children. Koomen and Hoeksma (1990) have argued that the attachment of children born with cleft lip and palate may be developmentally at risk for several reasons. Firstly, children with cleft lip and palate are hospitalized once or twice during their first year of life. It is generally assumed, though not well documented, that hospitalization may affect attachment behaviour. Secondly, observations by Field and Vega-Lahr (1984) suggest that mothers of children with cleft lip and palate are less responsive to their children than other mothers. This fact has also been observed by Wasserman *et al.* (1987). In the same study, however, no differences were observed with respect to attachment. The findings of the studies mentioned do not allow the formulation of specific hypotheses with regard to differences in the development of attachment

behaviours between children with and without cleft lip and palate. They nevertheless warrant further exploration of possible differences.

METHODS

Sample

The sample consisted of 67 children and their mothers from intact families: 33 healthy children were born with cleft lip and palate and 34 without this anomaly. The children with cleft lip and palate were recruited through so-called cleft lip and palate teams from hospitals in two large Dutch cities (Amsterdam and Rotterdam). The other children were recruited with the help of family doctors and midwives who delivered the children with cleft lip and palate. (The help of family doctors and midwives was sought to facilitate matching.)

The two groups were matched with regard to date of birth (plus or minus 1 week), parity (42% first-born; 58% later-born), dwelling place (60% city; 40% village) and sex (79% boys; 21% girls). The non-uniform sex distribution is due to the larger number of boys that are generally born with cleft lip and palate. The groups appeared to be balanced with regard to the level of education of both parents, which was measured on a five-point scale ranging from 1: elementary education to 5: academic education. (Mean level of education of mothers: CLP=2.15 (SD=1.20), control=2.21 (SD=1.36), $t=-0.17$, $p>0.25$; fathers: CLP=2.18 (SD=1.16), control=2.24 (SD=1.21), $t=-0.18$, $p>0.25$.)

Procedures

Mothers and children were visited at home by two female researchers when the children were 3, 6, 9 and 12 months of age. At each visit the so-called Induced Stress at Home procedure was carried out. One researcher instructed and guided the mother, while the other recorded the procedure by means of a portable video camera. At 12 months of age, approximately 1 week after the home visit, the mothers and children entered the Strange Situation, which was carried out in the laboratory according to the guidelines of Ainsworth *et al.* (1978). The procedure was videotaped using both a turntable and a fixed camera, which were operated from a control room.

The ISH procedure consisted of three episodes. During the first episode, lasting 4 minutes, mother and child played together using a standard tray

with toys. Mothers and children were free to choose their position, to the extent that the child could move freely. During the second episode the mother left the room. During her absence a tape was played with the mixed sounds of two crying babies who were undergoing a medical examination. The crying sounds were supposed to induce stress or fear. The choice of the crying sounds as a stress and fear inducer was based on the common observation that if one of several children in a hospital ward starts crying, the other children will soon join in. The second episode lasted 2 minutes, but was abbreviated when the child became too upset by the crying sounds and the mother wished to return sooner. The third episode started when the mother reentered the room. The mother was instructed to wait a few seconds at the door to take notice of the reactions of her child and then to comfort the child if necessary and to resume playing with the child when possible. This final episode lasted 4 minutes.

Measurements

To score the behaviour of the child during the second episode of the ISH procedure, a five-point observational scale was used, labelled the Overtly Expressed Distress scale. Scores were assigned to the child's behaviour according to: 1: the child keeps on playing with the toys during the whole episode; 2: the child is alarmed by the tape-recorded cries, but still pays attention to the toys; 3: the child is alarmed by the taped cries and stops playing with the toys; 4: the child is alarmed and every now and then releases a cry; 5: the child cries most of the time. In line with our introductory remarks, the OED scale was used as an index of activation of the attachment system.

The behaviour of the child during the third episode of the ISH procedure was scored using the four interactive scales: proximity seeking, contact maintenance, resistance and avoidance, as described by Ainsworth *et al.* (1978). Of course, the same scales were used to rate the behaviour of the children during the two reunion episodes of the Strange Situation.

Interobserver Agreement

All tapes of the ISH procedure were scored by the second author. To estimate interobserver agreement, 15 randomly selected 3-month tapes and another 15 randomly selected 12-month tapes were rescored by an independent second trained

observer. Interobserver agreement (Pearson correlations) for the various scales at the respective ages of 3 and 12 months were: OED scale: 0.80 and 0.88; proximity seeking: 0.96 and 0.86; contact maintenance: 0.93 and 0.99; resistance: 0.72 and 0.61; avoidance: 0.86 and 0.91.

Social interactive behaviours in the Strange Situation were scored independently by two observers: the second author and a second trained observer. Interobserver agreement based on all cases for the first and second reunion episode were respectively: proximity seeking: 0.84 and 0.85; contact maintenance: 0.87 and 0.90; resistance: 0.91 and 0.94; avoidance: 0.84 and 0.85. In subsequent analyses averages across observers will be used.

Analyses

The development of the attachment behaviours was analysed by means of multilevel modelling for longitudinal data (Goldstein, 1986, 1987; Bryk and Raudenbush, 1987; Hoeksma and Koomen, 1992). Longitudinal multilevel modelling is a statistical technique by means of which average and individual curves are fitted to the data. The average curve is expressed as a polynomial function $Y_t = \beta_0 + \beta_1 \cdot X_t + \beta_2 \cdot X_t^2$, or a polynomial of a higher degree, where Y_t is the expected value of a variable of interest on occasion t and X_t is the age on occasion t . The parameter β_0 is labelled the intercept, β_1 the linear coefficient and β_2 the quadratic coefficient. Together the estimates of the parameters, which are obtained from the data, determine the shape of the curve.

The individual curves are expressed as deviations from the average curve. The individual curve of child i is written as $Y_{it} = (\beta_0 + \mu_{0i}) + (\beta_1 + \mu_{1i}) \cdot X_{it} + (\beta_2 + \mu_{2i}) \cdot X_{it}^2$. The parameter μ_{0i} is the deviation of the individual intercept from the average intercept β_0 ; its variance across individuals ($\text{var}(\mu_{0i})$) is designated by σ_0^2 . In the same way, μ_{1i} is the deviation of the individual linear coefficient from the average linear coefficient (β_1) with $\text{var}(\mu_{1i}) = \sigma_1^2$. In the model the individual deviations are allowed to be correlated. The covariance between μ_{0i} and μ_{1i} ($\text{cov}(\mu_{0i}, \mu_{1i})$) is designated by σ_{01} . In principle, the quadratic coefficient could also vary across individuals. In the analyses to be presented, significant variation of the quadratic coefficient was never found, however, for which reason we do not discuss it here (see Goldstein, 1987). The model cannot fully explain the individual observations Y_{it} , so a residual e_{it} has to be added to the model. The

residual or non-explained variance ($\text{var}(e_{it})$) is designated by σ^2 .

The variance of the individual intercepts σ_0^2 and that of the individual linear coefficients σ_1^2 have the following interpretation: σ_0^2 is interpreted as a measure of individual differences in the level (intercept) of the curves at age t_0 , whereas σ_1^2 is a measure of individual differences in the direction (slope) of the curves at age t_0 . In the present analyses t_0 represents the age of 7.5 months, i.e. the age midway between the ages of 3 and 12 months. (The age variable was rescaled by subtracting the mean age for computational convenience.)

The relationship between activation of the attachment system (indexed by the OED scale) and the subsequent attachment behaviour was investigated by means of an augmented multilevel model. The model was extended by means of the OED variable as an explanatory variable. The extended model can be written as $Y_{it} = \beta_0 + \beta_1 \cdot X_{it} + \beta_2 \cdot X_{it}^2 + \gamma_1 \cdot Z_{it} + \gamma_2 \cdot Z_{it}^2 + \delta \cdot Z_{it} \cdot X_{it}$, where Z_{it} is the level of overtly expressed distress on occasion t by child i . The model embodies the supposition that the effects of distress may be a combination of a linear and a non-linear effect (parameters γ_1 and γ_2). In addition, it is assumed that the effect of distress may be age-dependent (interaction parameter δ). Finally, we note that in the model X refers to the rescaled age variable, whereas X' is measured on the original age scale running from 3 to 12 months.

The purpose of multilevel analysis is to find a model which parsimoniously describes the observed data. A minimal model contains the intercept β_0 and the variance of the intercept σ_0^2 . Parameters for the average curve (β_1 , β_2 , γ_1 , γ_2 and δ) are added to the model when they exceed twice their estimated standard errors. The variance of the linear coefficient σ_1^2 is added when it approximately exceeds twice its standard error and/or decreases the residual variance by a substantial amount (more than 10–20%).

RESULTS

Validity

Is the ISH procedure a valid instrument to measure attachment behaviours? An answer to this question was obtained by first computing the correlations between the scores of the social interactive scales from the ISH procedure and the Strange Situation at 12 months of age. To increase the reliability of the social interactive variables in the Strange

Situation, the respective variables were averaged across reunion episodes. Next, the social interactive variables of each of the two procedures were subjected to a principal components analysis and the resulting factor loadings were compared. Subsequently, individual factor scores for the ISH procedure and the Strange Situation procedure were computed and correlated. Finally, canonical correlations were computed between interactive variables in the ISH procedure and the attachment classifications in the Strange Situation.

Table 1 shows the correlations between the respective social interactive scales in the ISH procedure and the Strange Situation. The variables proximity seeking, contact maintenance and avoidance correlate moderately across the two procedures. Resistance appeared to be not significantly correlated ($p > 0.05$). The second column of Table 1 contains the correlations of stability of the interactive scales across the two reunion episodes in the Strange Situation, which may be used to interpret the level of the correlations in the first column.

The principal components analysis of the four social interactive variables of the ISH procedure resulted in a two-factor solution, accounting for 82.4% of the variance (factor I: 57.4%, eigenvalue 2.3; factor II: 25.0%, eigenvalue 1.0). The loadings on the two factors amounted to: 0.94 and -0.02 for proximity seeking; 0.94 and 0.02 for contact maintenance; 0.48 and 0.76 for resistance; and -0.56 and 0.65 for avoidance. Using the selection criterion of eigenvalues greater than 1, the principal components analysis of the social interactive variables scored in the Strange Situation would have resulted in a one-factor solution. A two-factor solution was preferred, however, in order to compare it to the solution of the ISH procedure. Together the two factors accounted for 84.8% of the

variance (factor I: 67%, eigenvalue 2.7; factor II: 17.8%, eigenvalue 0.71). The factor loadings of the social interactive variables in the Strange Situation were: 0.88 and 0.2 for proximity seeking; 0.90 and 0.09 for contact maintenance; 0.69 and 0.50 for resistance; and -0.65 and 0.68 for avoidance. Comparison of the factor loadings of the ISH procedure and the Strange Situation reveals a close resemblance, indicating a common factor structure. Next, individual factor scores were computed and correlated; the scores of factor I in the ISH procedure and of factor I in the Strange Situation correlated 0.52 ($p < 0.001$). The respective second factors did not correlate significantly ($r = 0.08$; $p > 0.05$).

To further substantiate the validity of the ISH procedure, canonical analysis was performed between the four interactive variables on the one hand and the attachment classification on the other. Forty-four children were securely attached, 13 avoidantly attached and eight resistantly attached. The first canonical correlation between the interactive variables in the ISH procedure and the attachment classifications in the Strange Situation amounted to 0.49 ($p < 0.05$); the second canonical correlation amounted to 0.11 (NS).

Taken together, the results so far warrant the conclusion that the ISH procedure is a valid instrument for measuring the attachment behaviours proximity seeking, contact maintenance and avoidance. It does not seem to be a valid alternative for measuring resistance.

Development of Attachment Behaviours

Proximity Seeking

It was hypothesized that the intensity or level of proximity seeking would increase with age. The average developmental curve of proximity seeking did indeed appear to be (linearly) increasing (see Table 2). The monthly increase appeared to be rather small, however (0.075 points per month, Table 2). The effects of presence of cleft lip and palate were tested by adding a dummy variable to the average model (code 1: cleft lip and palate; code 0: normal group). There appeared to be no significant difference between the two groups. Tests of interactions between group and age also gave negative results.

The variance of the intercept and linear coefficient (Table 2) accounted for approximately 23.5% of the total variance. Figure 1 shows how the individual curves vary from child to child: for most of the children the level of proximity seeking

Table 1. Relationships (Pearson correlations) between attachment behaviours in the ISH procedure and the Strange Situation (first column); and between attachment behaviours in the reunion episodes of the Strange Situation (second column)

	ISH and SS	Reunions 1 and 2
Proximity seeking	0.51*	0.61*
Contact maintenance	0.41*	0.71*
Resistance	0.18	0.58*
Avoidance	0.46*	0.71*

* $p < 0.01$.

Table 2. Parameter estimates including estimated standard errors (in brackets) of multilevel models regarding the development of: proximity seeking (Ps), contact maintenance (Cm), resistance (Re), avoidance (Av) and overtly expressed distress (OED)

Estimates	Ps	Cm	Re	Av	OED
β_0	2.01 (0.11)	1.87 (0.10)	1.66 (0.092)	2.49 (0.10)	2.98 (0.082)
β_1	0.075 (0.027)	0.0035 (0.033)	—	—	0.005 (0.024)
σ_0^2	0.018 (0.14)	0.12 (0.12)	0.22 (0.11)	0.28 (0.16)	0.22 (0.082)
σ_1^2	0.022 (0.11)	0.031 (0.014)	—	—	-0.020 (0.0072)
σ_{12}	-0.006 (0.028)	0.016 (0.026)	—	—	0.027 (0.017)
σ^2	—	1.99 (0.24)	1.42 (0.14)	2.43 (0.12)	0.89 (0.11)
σ_a^2	0.28 (0.034)	—	—	—	—

increases with age; for some the level is almost constant; whereas for other children the level decreases. The covariance appeared to be small ($\sigma_{01} = -0.006$; $SE = 0.028$). From this it can be concluded that at 7.5 months of age (i.e. the centre of the age scale) the direction of development is independent of the level of development.

The analysis of the development of proximity seeking revealed a special feature. It appeared that the residual variance was not constant, but increased linearly with age (σ_a in Table 2) (see Goldstein, 1987), which accounts for the increasing variance of the proximity scores with age.

Contact Maintenance

The average level of contact maintenance appeared to be constant across age (Table 2). No

significant effects of cleft lip and palate were found. The linear coefficient was rather small compared to its standard error. The coefficient was nevertheless kept in the model to allow an appropriate estimate of the individual variation of the linear coefficient (σ_1^2). Figure 2 represents this individual variation of the development curves of contact maintenance by means of the estimated individual curves. The variance of the intercept and linear coefficient accounted for approximately 19.0% of the total variance.

Resistance

In the analysis of resistance the minimal model could not be improved by adding parameters (Table 2). The average level of resistance appeared to be constant across age. In addition, it appeared that the variance of the individual levels of

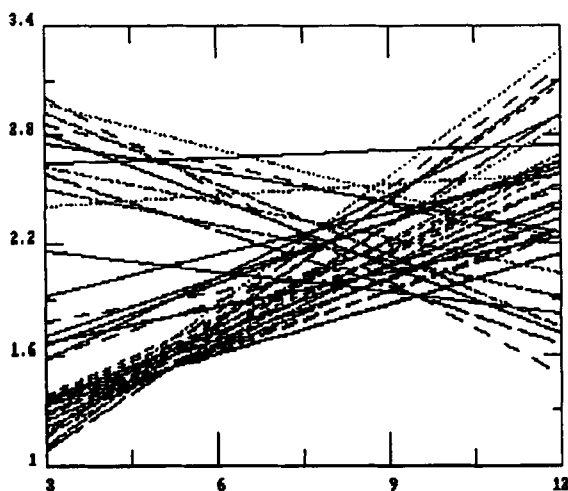


Figure 1. Level of proximity seeking against age (months): individual developmental curves.

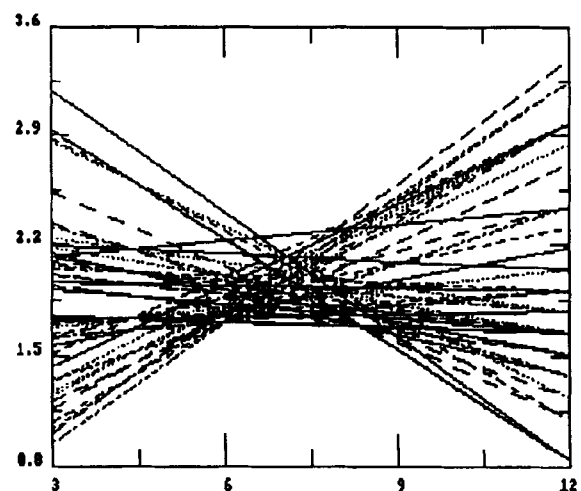


Figure 2. Level of contact maintenance against age (months): individual developmental curves.

resistance (σ_0^2) was rather small compared to the residual variance (σ^2), accounting for 13.3% of the total variance. From this it may be concluded that the individual level of resistance is rather unstable across age.

Avoidance

The average level of avoidance also appeared to be constant across age (Table 2). Neither the linear coefficient nor the variance of the linear coefficient appeared to be significantly different from zero. The percentage of total variance explained by the variation of the intercepts of individual curves (10.2%) appeared to be rather small, from which it may be concluded that the individual level of avoidance is not very consistent across age.

Finally, we analysed the development of the level of overtly expressed distress (see Table 2). It appeared that the level of distress was constant across age. The average level was 2.98, which corresponds to the label 'The child is alarmed and stops playing with the toys'. At the individual level both increasing and decreasing linear trends were observed. The variance of the individual curves accounted for approximately 33.5% of the total variance.

Activation of the System and Subsequent Behaviours

In the introductory section, we interpreted the behaviour of the child during reunion with its mother in the light of Bowlby's notions about increasing goal directedness and preferential treatment by the mother. This interpretation led to the supposition that the level of the child's attachment behaviours during reunion is dependent on the level of activation of its attachment system during separation. The level of activation

of the attachment system is operationalized by the OED scale.

Proximity Seeking

Table 3 contains the parameter estimates of the extended model for proximity seeking. The level of proximity seeking in the third episode appeared to be non-linearly dependent on the level of overtly expressed distress during the previous episode. The linear age effect together with the quadratic effect of distress accounted for 41.5% of the total variance (multiple $r=0.64$). The parameter δ was not significant, which leads to the conclusion that the relationship between overtly expressed distress and proximity seeking is constant across age.

Figure 3(a) illustrates the relationship between proximity seeking and overtly expressed distress. Four curves are shown, one for each age. The curves differ in height, but not in shape. The differences point to the already noted slowly increasing level of proximity seeking with age. The curves make clear that children especially seek proximity to their mothers when they experience high levels of distress.

Contact Maintenance

Contact maintenance also appeared to be non-linearly related to the level of overtly expressed distress. In addition, it appeared that the effect of distress changes with the age of the child. Table 3 contains the parameter estimates of the model. The percentage of variance explained by these effects was 43.7% (multiple $r=0.66$).

Based on the parameter estimates, Figure 3(b) shows how the relationship between overtly expressed distress and contact maintenance changes with age. It appears that high levels of distress result in comparatively more contact

Table 3. Parameter estimates including estimated standard errors (in brackets) of multilevel models regarding the relationship between overtly expressed distress and subsequent attachment behaviours: proximity seeking (Ps), contact maintenance (Cm), resistance (Re) and avoidance (Av)

Estimates	Ps	Cm	Re	Av
β_0	1.36 (0.47)	2.16 (0.45)	0.39 (0.20)	3.64 (0.27)
β_1	0.046 (0.021)	—	—	—
γ_1	-0.55 (0.32)	-1.10 (0.30)	0.57 (0.08)	-0.39 (0.084)
γ_2	0.22 (0.051)	0.33 (0.049)	—	—
δ	—	-0.016 (0.0070)	-0.019 (0.0064)	—
σ_0^2	0.038 (0.063)	0.00 (0.00)	0.18 (0.087)	0.16 (0.14)
σ^2	—	1.38 (0.12)	1.19 (0.12)	2.33 (0.23)
σ_a^2	0.20 (0.020)	—	—	—

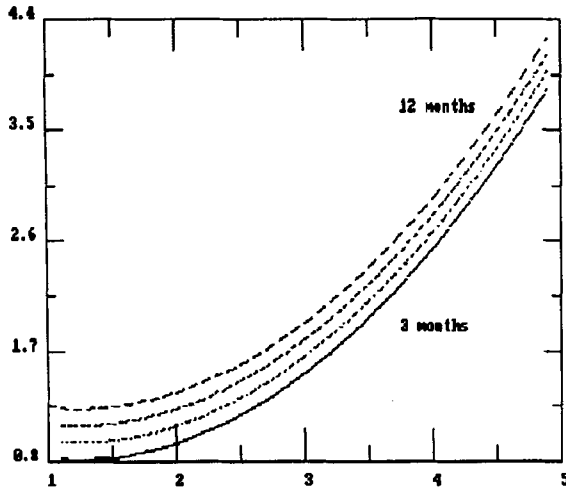


Figure 3(a). Level of proximity seeking against overtly expressed distress (scores 1-5) on four measurement occasions (3, 6, 9 and 12 months).

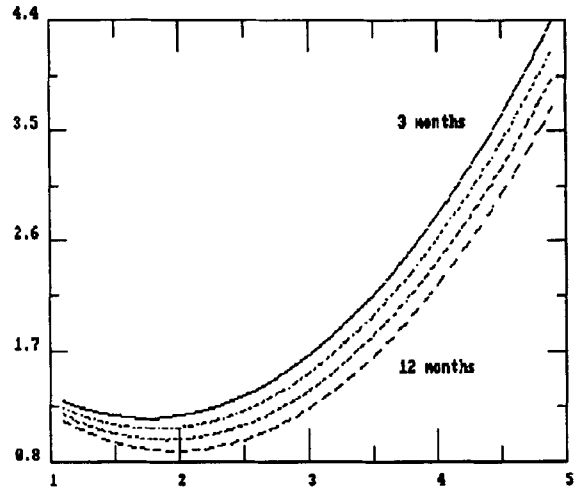


Figure 3(b). Level of contact maintenance against overtly expressed distress (scores 1-5) on four measurement occasions (3, 6, 9 and 12 months).

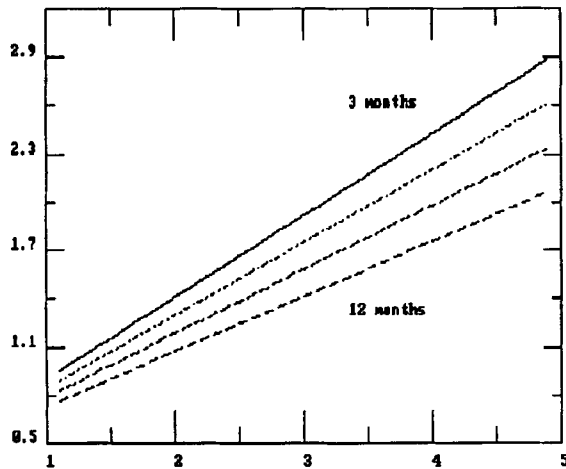


Figure 3(c). Level of resistance against overtly expressed distress (scores 1-5) on four measurement occasions (3, 6, 9 and 12 months).

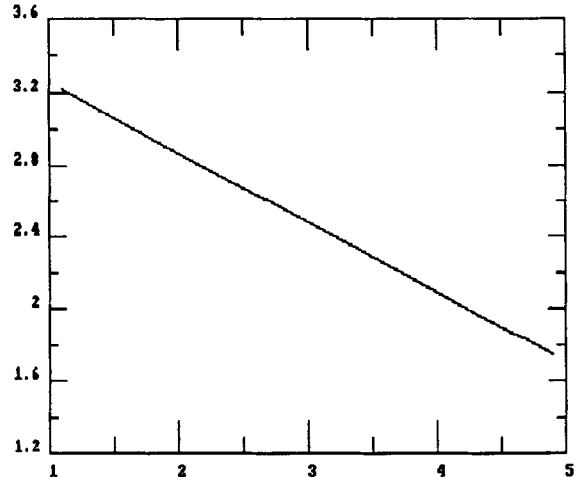


Figure 3(d). Level of avoidance against overtly expressed distress (scores 1-5) on four measurement occasions (curves coincide).

maintenance at younger ages. The same holds for lower levels of distress, but to a lesser extent. As such, the observed pattern is opposite to the predicted pattern.

Resistance

The level of resistance proves to be linearly dependent on the level of distress. This dependency decreases with age. Figure 3(c), which is

based on the parameter estimates in Table 3, shows that a high level of distress at a younger age leads to a higher level of resistance than the same amount of distress at an older age. Note that this pattern of change is in agreement with the stated hypothesis about the changing function of resistance in the attachment system. The pattern accounts for 16.2% (multiple $r=0.40$) of the total variance.

Avoidance

Figure 3(d) shows the relationship between overtly expressed distress and avoidance (see Table 3 for the parameter estimates). Avoidance appears to be negatively related to emotional distress. The relationship is the same at different ages. It accounts for 8.0% (multiple $r=0.28$) of the total variance.

To end the Results section, we note that for all four social interactive behaviours we tried to improve the models by adding effects of cleft lip and palate, including interactions, but that for none of the variables were such effects found.

DISCUSSION

To investigate the developmental course of the child's attachment behaviours during its first year of life, we constructed the ISH procedure. We have already concluded that the procedure is a valid instrument for measuring proximity seeking, contact maintenance and avoidance. Together, these three behaviours define a common factor which, after Connell (1985), can be labelled 'proximity/contact vs avoidance'. This first factor correlates substantially with the first factor of the Strange Situation. Its generalizability is further enhanced by the fact that Connell (1985, p. 238) identified the same factor with almost identical factor loadings in his analysis of 299 12-13-month Strange Situations. The validity of the ISH procedure is further supported by the observed strong association between interactive behaviours in the ISH procedure and the attachment classification in the Strange Situation.

The validity of the measurement of resistance in the ISH procedure is clearly more problematic. Although it has approximately the same place in the factor solutions of the two procedures, the two ratings appeared to be unrelated. The approximately zero correlation cannot be completely attributed to the borderline interobserver agreement for resistance in the ISH procedure. A rather trivial explanation is that it is due to a difference in instructions between the two procedures. In the ISH procedure the mother is instructed to approach the child soon after she reenters the room, whereas in the Strange Situation the mother is free either to approach the child or to sit down at some distance from the child. In the latter case resistance is not likely to be observed.

The investigation of validity is not a one-sided affair. The ISH procedure also gives some insight into the validity of the Strange Situation. It has been suggested, for instance, that the Strange Situation lacks what is called ecological validity (Field, 1987b; Lamb *et al.*, 1985; Van IJzendoorn, 1988) because of its artificial set-up and the fact that it is carried out in the laboratory. The observed relation between the 'home' and 'laboratory' procedure tempers such a suggestion at least partially.

With regard to the normative development of proximity seeking and contact maintenance, we hypothesized that their intensity would increase with age. For the normative development of resistance and avoidance no specific hypotheses were offered. It was hoped that the observation of clear developmental trends would help in this respect. Apart from the already noted small monthly increase of proximity seeking, clear developmental trends were observed for none of the behaviours. The approximate mean constancy of the behaviours could be due to the child's habituation to the ISH procedure as a result of its 3-monthly repetition. In addition, it could be the result of an inability of the ISH procedure to reveal developmental trends. Neither of the two explanations is very plausible: the observed constancy of the OED level across age argues against the first explanation, whereas the clear trends of the individual curves portrayed in Figures 2 and 3 argue against the second. The same plots show, however, that the direction of development of both proximity seeking and contact maintenance is not uniform across children: that is, both positive and negative directions of change were observed. In the light of this non-uniformity, the constant average level of proximity seeking and contact maintenance becomes a plausible and comprehensible result.

The expectations about the normative development of attachment behaviours were derived from Bowlby's notion about increasing goal directedness and organization around the primary caregiver. Does the absence of developmental trends imply that these notions should be rejected? The results of the analyses of the relationship between activation and subsequent behaviours contain important contradictory evidence. First of all, the general hypothesis that the relationship between activation of the attachment system and subsequent behaviours is stronger for the attachment behaviours proximity seeking and contact maintenance, compared to the 'non-attachment' behaviours resistance and avoidance, is clearly confirmed. Moreover, it appeared that comparable levels of

overtly expressed distress result in a decreasing level of resistance when the child becomes older. This is clearly in accordance with the stated hypothesis about the changing relationship between activation of the attachment system and resistance.

The results with regard to contact maintenance seems to refute the stated hypothesis. It appears that comparable levels of distress result in lower levels of contact maintenance at later ages. Such a pattern of change was not expected for a behaviour which literally serves the set goal of the attachment system, i.e. keeping proximity to the mother. The observed pattern of change and the assumption about increasing goal directedness can be reconciled, however, by taking a closer look at the definition of contact maintenance which refers to active and *persistent* attempts to maintain contact (Ainsworth *et al.*, 1978). According to this definition, high levels of contact maintenance point to a slow termination of activation of the attachment system, whereas low levels point to quick termination. If, next, we assume that increasing goal directedness results in faster termination of activation of the system, the observed pattern of change becomes understandable.

No age changes were observed with regard to the relationship of the level of overtly expressed distress during separation and the levels of proximity seeking and avoidance during reunion. At first sight these results suggest that the functioning of the attachment system does not change with age with regard to these two behaviours. We think that additional research is needed, however, before such a conclusion can be warranted. Some directions for future research will be given after discussing one final result of the present study.

Differences between children with and without cleft lip and palate were not observed, neither with regard to the normative development of attachment behaviours nor with regard to the development of the relationship between activation of the attachment system and subsequent behaviours. This finding is reminiscent of the findings of Wasserman *et al.* (1987), who observed no differences in the quality of attachment at 12 months of age between handicapped children, including children with cleft lip and palate, and non-handicapped children. It is also in line with the more general finding in attachment research that patterns of attachment do not appear to differ between atypical and normal infants (Field, 1987; Van IJzendoorn *et al.*, 1992; see also Van den Boom, 1988, for a notable exception to the rule).

There are at least three ways to improve the present research. Firstly, Bowlby's notion about increasing organization around the primary caregiver was studied indirectly by only looking at the child's behaviour towards its mother. It would be an easy step to extend the present study by looking at the child's attachment behaviours towards different persons, for instance fathers, elderly brothers and sisters, and strangers. Secondly, we consider that the measurement of activation of the attachment system should be supplemented by other measurements. The OED scale is by definition restricted to overtly expressed distress. Because activation of the system may be covert (Ainsworth *et al.*, 1978; Sroufe and Waters, 1977b), future studies should employ more subtle measurements of activation of the attachment system. Such measurement instruments are currently being studied at our laboratory by Verweij (1996) in an attempt to unravel the function of avoidance within the attachment system. Finally, it should be noted that the ISH procedure was carried out only once at each age. In future research it would be advisable to repeat the procedure using divergent stress inducers on each occasion, in order to increase its generalizability.

One of the main lessons to be learned from the present study is that research into the child's attachment does not need to be restricted to the end of the child's first year of life. Investigations may be aimed at earlier phases of development, when the child is even more dependent on the protection and security offered by its caregivers. As such, the ISH procedure offers a promising tool for circumventing the age limits imposed by the Strange Situation and for continuing the study of the development of attachment behaviours and the functioning of the attachment system.

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